Universität Siegen
Lehrstuhl Theoretische Informatik
Markus Lohrey

Exercise 5

Task 1
Does the algorithm "Median of the Medians" run in linear time, if one uses blocks of three or blocks of nine?

Task 2
Which of the following pairs is a subset system, respectively matroid?

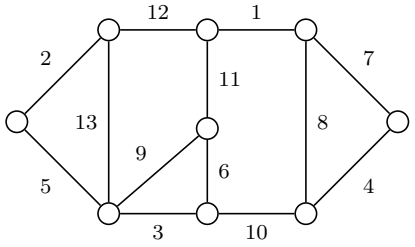
(a) $(\{1,2,3\}, \{\emptyset, \{1\}, \{2\}, \{3\}, \{1,2,3\}\})$

(b) $(\{1,2,3\}, \{\emptyset, \{1\}, \{2\}, \{3\}, \{2,3\}\})$

(c) (E, U), where E is a finite set and $U = \{A \subseteq E \mid |A| \leq k\}$ for a $k \in \mathbb{N}$.

(d) (E, U), where E is a finite subset of a vector space (for instance $\mathbb{R}^2$) and U consists of all linearly independent subsets of E.

Task 3
Compute a spanning subtree of maximal weight using Kruskal's algorithm for the following graph:



How does the result change, when you want to compute a spanning subtree of minimal weight?

Task 4

(a) Show that for each tree $T = (V, E)$ with $|V| > 0$ we have $|E| = |V| - 1$.

(b) Show that every finite connected graph has a spanning subtree.